

PERINATAL LESSONS FROM THE PAST

Galen (AD 129–200) of Pergamun: anatomist and experimental physiologist

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Galen was a brilliant anatomist and pioneer of experimental physiology. His many important discoveries exerted a profound influence on medicine during the next 1400 years. However, his wish to solve all the problems of health and disease led him to speculate and draw mistaken conclusions which were widely believed until after the Renaissance.

Galen (Gr: galenos: calm, serene) was the only child of Nikon, a cultivated and wealthy architect and his turbulent wife. He was born on 22 September AD 129, in Pergamun, 15 miles from the Aegean in the northwest of Asia Minor. This was a magnificent Greek city, a centre of culture, which came under Roman rule in AD 133. The library in earlier times had so rivalled that of Alexandria that the Ptolemies had forbidden the export to it of papyrus for making paper. As a result, Pergamene scholars turned to the use of animal skins, which became known as "charta pergamena", and later as "parchment".

Galen received an excellent early education from his father. At the age of 14, he spent three years at the school of philosophy in Pergamun followed by two years studying medicine with a number of practising physicians, especially Satyrus, a disciple of Hippocrates. In AD 149, his beloved father died, and for the next nine years Galen extended his medical studies first in Smyrna under Pelops, then in Corinth, and finally in Alexandria, where he absorbed the knowledge of anatomy and physiology handed down by the 3rd century BC physicians, Herophilus and Eristratius, and the 1st century AD anatomist, Marinus, who is also said to have been born in Pergamun.

In AD 157, Galen returned to Pergamun and was appointed gladiatorial surgeon there for the next three years. In AD 161, he travelled to Rome where he practised and gave public lectures and demonstrations. His reputation rose rapidly and with it the envy of other physicians. Perhaps because of this, Galen returned to Pergamun in AD 166 after just five years. However, his fame had come to the attention of the philosopher Roman Emperor Marcus Aurelius, and in AD 169 he received an imperial summons to return to Italy. He was 40 years old (fig 1). Once there he served as court physician first to Marcus Aurelius until his death in AD 180, then to his son Commodus, and next to Septimus Severus until his own death at the age of 70 in AD 200.¹⁻⁴

Galen wrote: "My father taught me to despise the opinion and esteem of others and to seek only

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the truth . . . He insisted further that the primary end of personal possessions is to relieve hunger, thirst, and nakedness, and if more than sufficient remains it should be transmitted into good works." Elsewhere he added: "It is impossible at the same time to engage in business, and to practice so great an Art." Throughout his life he was immensely industrious. His ambition was no less than to thoroughly investigate the whole of anatomy and physiology and to explain and treat all the problems of medicine.⁵ Being unmarried and wealthy, he had few distractions and was able to employ not only research assistants but also copyists to take down his dictation. He claimed: "Whoever seeks fame by deeds, not alone by learned speech, need only become familiar, with small cost of trouble, with all that I have achieved by active research during the course of my entire life." It is thought that he wrote more than 400 treatises covering every branch of medicine and philosophy. Unfortunately only a hundred or so have survived, many being lost in a fire in his villa outside Rome in about AD 195.



Figure 1 Galen (AD 129–200).

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Galen was a firm disciple of Hippocrates and a believer in Nature. He wrote: "Hippocrates . . . was the first known to us of all those who have been both physicians and philosophers inasmuch as he was the first to recognize what Nature effects." "He enjoins a thorough study of the nature of the body which we are endeavouring to heal, as well as the properties of all those factors from daily exposure to which the body becomes of itself more healthy or more sickly." Among Galen's aphorisms were: "Nature does nothing without a purpose" and "The physician is Nature's assistant". Elsewhere he added: "Employment is Nature's physician, and is essential to human happiness" and "Confidence and hope do more good than physic".

Galen's confidence in his own ability was almost without limit. He wrote: "Now let me once and for all make this general statement to apply to my whole treatise so as not to be forced to say the same thing repeatedly: I am now explaining the structures actually to be seen in dissection, and no one before me has done this with any accuracy. Hence, if anyone wishes to observe the works of Nature, he should put his trust not in books on anatomy but in his own eyes and either come to me, or consult one of my associates, or alone by himself industriously practice exercises in dissection; but so long as he only reads, he will be more likely to believe all the earlier anatomists because there are many of them."¹ And he added: "I have continued my practice on until old age, and never as yet have I gone far astray whether in treatment or in prognosis, as have so many other doctors of great reputation."

Galen was not only a brilliant anatomist but introduced an anatomical concept of disease and was also a great pioneer of experimental physiology. He appreciated the importance of the relationship between structure and function stating: "It is impossible for anyone to find the correct function of a part unless he is perfectly acquainted with the action of the whole instrument". He provided beautiful descriptions of his work. As he wrote: "The chief merit of language is clearness, and we know that nothing detracts so much from this as do unfamiliar terms".

The reader may judge for himself:

On the neuromuscular system¹

"When I tell them this, and add that all voluntary movement is produced by muscles controlled by nerves coming from the brain, they call me a 'teller of marvellous tales' . . . No one has ever been able to withstand me when I have demonstrated the muscles of respiration and voice. The muscles move certain organs, but they themselves require, in order to be moved, certain nerves from the brain, and if you intercept one of these with a ligature, immediately the muscle in which the nerve is inserted and the organ moved are rendered motionless."

Galen had a remarkably modern concept on how to preserve one's health in relation to diet, exercise, etc.⁶

On hygiene

"After my twenty-eighth year from birth, having persuaded myself that there is a certain art of hygiene, I followed its precepts for my subsequent life, so I was no longer sick with any disease except an occasional fever."

". . . to me it seems that those who through ambition or zeal have chosen some form of life so involved in affairs of business that they can have little leisure for the care of their bodies, are also willing slaves to hard masters. So that for these it is impossible to prescribe

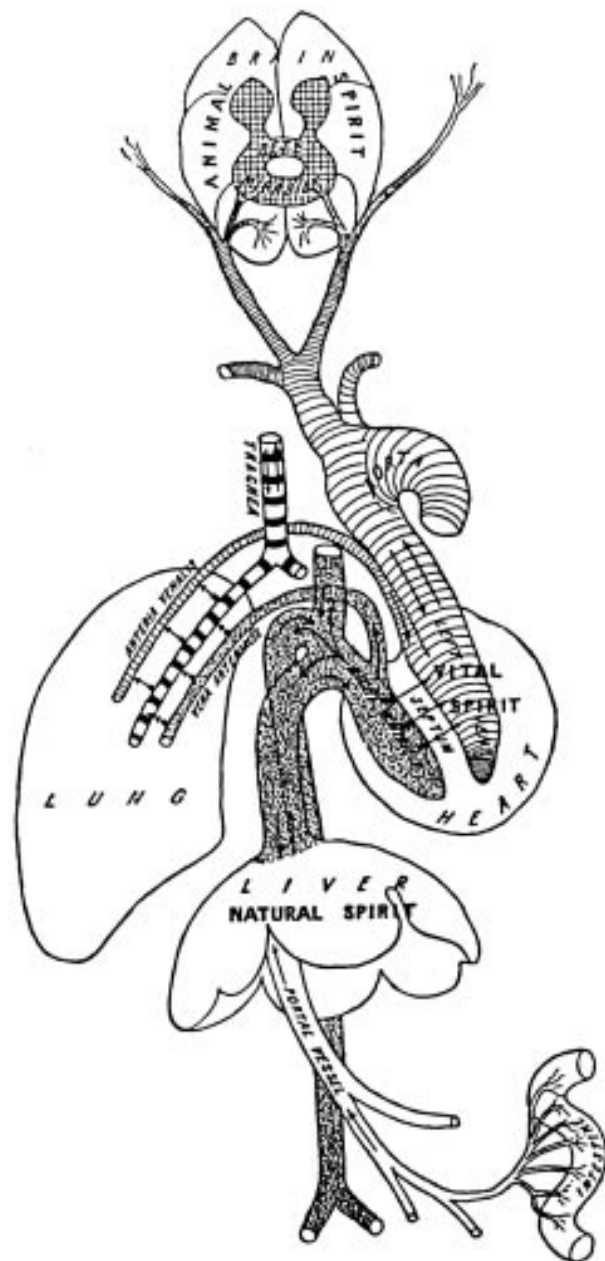


Figure 2 Galen's physiological system. Courtesy of Clarendon Press.⁸

absolutely perfect care of the body. But whoever is completely free, both by fortune and by choice, for him it is possible to suggest how he may enjoy the most health, suffer the least sickness, and grow old most comfortably."

On surgical practice

"All the operations in surgery fall under two heads, separation and approximation. Approximation has to do with the reduction and dressing of fractures, reduction of dislocation of the joints, reductions of prolapsed intestines, uterus, or rectum, suture of the abdomen and restoration of tissue deficiencies, as in the nose, hips and ears. Division is concerned with simple incisions, circumcisions, elevations of the skin, scalping, excision of veins, amputation, cauterization, scraping, smoothing, excisions with the saw."

Galen also described 347 herbal remedies, which earned him the title of father of pharmacology. The following extracts from his works demonstrate his interest too in the fetus and in infant care.

On the fetal cardiovascular system⁷

Galen made an outstanding contribution to knowledge of the fetal cardiovascular system. He was the first to describe the foremen ovale with valve, and ductus arteriosus, and he wrote briefly of their closure after birth and also of the intrafetal portions of the umbilical vessels, writing: "And nature's destruction of fetal structures that are superfluous in the adult seems to me something much greater even than her original creation of those structures." He demonstrated that the left side of the heart and arteries contained blood rather than "pneuma" or vital spirit and that the heart was responsible for arterial pulsation. He noted that the placental umbilical arteries ceased to pulsate if the umbilical cord was compressed proximally. Although he offered many ingenious physiological explanations for his cardiovascular observations, many were incorrect. For example, he thought that venous blood passed through minute pores in the interventricular septum into the left ventricle. He also had no concept of the circulation, believing that the blood ebbed and flowed (fig 2). However, he added: "Such is the opinion that we hold about their use, and it will serve us until we discover by some scientific means their real purpose. Perhaps the uses we have suggested are quite correct, yet it is possible that a more accurate account of the function may be discovered".⁸

On infant feeding

"She shall feed the child only on (mother's) milk, but when he has cut his front teeth it is well to accustom him to more solid food, as women do of their own accord, having learnt this by experience."

" . . . children fed on the mother's milk, are not only having the customary food but also the most proper, and Nature seems not only to have prepared such nourishment for infants, but at the same time endowed them from the beginning with an inborn faculty enabling them to use it. For if you place the teat in the mouth of the child just born it sucks and swallows most readily."

On the crying infant

"In little children whose health is perfectly good, it is a matter of no small care to avoid excessive disturbance. For as they are devoid of reasoning, their cries and screams and rushing about mean that something is annoying them. So we guess what they want and give it to them before their petulance increases and mind and body become more violently excited . . . For whether they are teething, or pained in some part from some external cause, or want to pass stool or urine or to eat or drink, they show constant restless movements as if in distress. It may be that they want warmth when they are cold, or cool when they are hot, or they are in discomfort from their swaddling bands, for even those are a burden."

"I have also noticed that his cot and all his wrappings were too dirty and the infant himself dirty and unwashed, and I have ordered him to be bathed and that she should change his napkins for clean ones, and when these things were done the infant has stopped kicking and has settled off in a long sleep. In this matter there is need not only of forethought but of daily habit."

"If it is not clear what they want and meanwhile the demand is becoming more urgent, let things be put right by immediately giving whatever is needed and so prevent their becoming exhausted. In the meantime by rocking in the arms and lullabies, such as the more experienced nurses use, one may seek to soothe them."

In modern times we tend to hear more of Galen's errors than his achievements. In part this reaction has stemmed from the extravagant homage paid to him for the 1400 years after his death and to the fact that he introduced philosophical and theological speculations that were often flawed, to interpret his otherwise brilliant observations and experiments. In addition, being denied dissection of the human body by Roman law, he was obliged to base his anatomical knowledge on the study of animals, particularly the Barbary ape and the pig. Though enthusiastic, he was also arrogant, dogmatic, contentious, and boastful, giving plenty of scope to his enemies and detractors. Nevertheless, had Galen lived in modern times, he would undoubtedly have earned several Nobel prizes. His discoveries on the neuromuscular system under the control of the brain, on respiration, speech, and on the structure and function of the urinary apparatus were particularly outstanding.³ Let this brief account end with Galen's description of a problem that many elderly and prostatic men will have no difficulty in recognising:

On urinary retention³

" . . . a peculiar affection is likely to befall the full bladder and we ourselves not only witnessed this occur but we have also heard of it from others. It has happened to those, who, when the bladder is full, are ashamed through feelings of modesty to leave the table and pass water, that its power is destroyed and then they can no longer urinate although they try very hard to do so."

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